Adsorption study of tetracycline onto an unsaturated polyester resin

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ABSTRACT

The present work was aimed to study the adsorption of tetracycline, an antibiotic drug. Adsorption studies were performed on adsorptive unsaturated polyester resin (UPR) at temperatures 30, 40, and 50°C. It is a low-cost potential effective absorbent and can be used to remove antibiotic tetracycline from aqueous solution. The preliminary investigations were carried out by batch adsorption. The experimental equilibrium data were tested by four widely used isotherm models namely, Langmuir, Freundlich, Tempkin, and Dubinin–Radushkevich. Thermodynamic parameters such as standard enthalpy (ΔH˚), standard entropy (ΔS˚), and standard free energy (ΔG˚) were determined. The negative value for ΔG˚ is indicating towards a spontaneous process and the positive value for ΔH˚ indicates that the adsorption of tetracycline to UPR is an endothermic process. The adsorption process followed pseudo-first-order model. The mass transfer property of the sorption process was studied using Lagergren pseudo-first-order kinetic models. The values of percentage removal and k_adj for drug systems were calculated at different temperatures (303–323 K). The mechanism of the adsorption process was determined from the intraparticle diffusion model. The results indicate that UPR can be used as an effective and low-cost adsorbent to remove tetracycline from aqueous solution.

Keywords: Adsorption; Kinetics; Isotherms; Tetracycline; Unsaturated polyester resin